

# Claims

- [c1] A method for dense and secure transmission of signals and information using a small number of channels, the method comprising
- a) choosing an appropriate integer modulus  $m$ , positive integer  $n$ , corresponding to the number of bits to be encoding, and generating  $n \times n$  matrix  $A$  with integer elements where the diagonal elements of  $A$  differs modulo  $m$  from all the other elements of their column, and where  $A$  can be written as matrix product  $BC$  where  $B$  is an  $n \times t$  matrix,  $C$  is a  $t \times n$  matrix, where  $t$  is less than  $n$ ;
  - (b) encoding the length- $n$  vector  $x$  to the length- $t$  vector  $xB$ , by vector-matrix product modulo  $m$ ;
  - (c) transmitting the coordinates of the length- $t$  vector  $xB$  on  $t$  channels;
  - (d) retrieving the coordinates of the vector by computing  $xBC = xA$  by vector-matrix product modulo  $m$ ;
  - (e) for every coordinate of vector  $xBC = xA$ , filtering out the terms added as the linear combination of other coordinates of vector  $x$ .
- [c2] A method according to claim 1, wherein the modulus  $m$  is non-prime- power composite positive integer, the di-

agonal elements of matrix  $A$  are non-zero modulo any prime-divisors of  $m$ , and each non-diagonal elements of matrix  $A$  are zero modulo for at least one prime divisor of  $m$ .

[c3] A method according to claim 2, wherein the filtering step for retrieving the original values of the transmitted 0-1 vector further comprising:

- (a) periodical change of the values of the coordinates of vector  $x$  with original value equal to 1 on values  $0, 1, 2, \dots, m-1$  in this order, and on values of  $m-1, m-2, \dots, 3, 2, 1, 0$  in this order of the coordinates of vector  $x$  with original value equal to 0;
- (b) measuring the periodicity of each coordinates of vector  $xBC = xA$ ;
- (c) if a coordinate has period less than  $m$  then it is be neglected;
- (d) if a coordinate has period equal to  $m$ , and it changes its values as  $0, 1, 2, \dots, m-1$ , then its original value was 1;
- (e) if a coordinate has a period equal to  $m$ , and it changes its values as  $m-1, m-2, \dots, 3, 2, 1, 0$ , then its original value was 0.

[c4] A method, according to claim 3, wherein the periodic change of the discrete values of the coordinates of vector  $x$  are approximated by continuous wave forms of electronic, magnetic or optical signals.

[c5] A method, according to claim 1, wherein between the communicating nodes  $R_1, R_2, \dots, R_n$  and  $S_1, S_2, \dots, S_n$  two networks are constructed, in the first network nodes  $S_1, S_2, \dots, S_n$  play the role of the senders and  $R_1, R_2, \dots, R_n$  play the role of the receivers, and in the second network  $R_1, R_2, \dots, R_n$  play the role of the senders and  $S_1, S_2, \dots, S_n$  play the role of the receivers.

[c6] A method, according to claim 1, wherein the filtering step for retrieving the original values of the transmitted 0–1 vector further comprising:

- (a) change of the values of the coordinates of vector  $x$  with original value equal to 1 to value 0, and the coordinates of vector  $x$  with original value equal to 0 to 1;
- (b) measuring the change of each coordinates of vector  $xBC = xA$ ;
- (c) if the change in the value of in coordinate  $i$  (where integer  $i$  is between 1 and  $n$ ) is not the  $i$ th diagonal element of matrix  $A$  modulo  $m$  or not  $(-1)$ -times the  $i$ th diagonal element of matrix  $A$  modulo  $m$ , then the change is neglected;
- (d) if the change in the value in coordinate  $i$  (where integer  $i$  is between 1 and  $n$ ) is the  $i$ th diagonal element of matrix  $A$  modulo  $m$  then original value was 0;
- (e) if the change in the value in coordinate  $i$  (where integer  $i$  is between 1 and  $n$ ) is  $(-1)$ -times the  $i$ th diagonal

element of matrix  $A$  modulo  $m$  then original value was 1.